

System Dynamics for Budget Planning and Management Control

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Abstract

Top management, through strategic plan, designs the guide lines of actions that are necessary to achieve company goals.

Methodologies and tools are essential for comparing the results reached through operative actions with those programmed; so that the management can analyse the differences and decide operations to better manage the future. In this area the principle aim is to support, who has the decision, with instruments that increase management knowledge. As a whole, the control system, is "simply" an overall feedback model, the results of which, if given in time to top management, allows him/her corrective actions that can be "vital" for company conduction.

Above knowing how things are going compared to what has been planned, top management needs to know which are the so called "master variables" that have particularly influenced the results.

What we will describe in this paper will be the following: how, through System Dynamics approach, a simple "feedback control" management model can be integrated with a "feed-forward system" so to support top management in the process of budget planning and management control.

Two problems will be particularly discuss that could be of interest;

- An application of dynamic problem definition as a prerequisite to a good System Dynamics modelling. This theoretical approach will be integrated also with an approach that imposes to define an aggregate model which contains, particularly, "master variables".
- The model will be discussed and developed together with an academic expert in Italian public accounting and this will be a way to spread out the knowledge in System Dynamics approach in Italian university environment.

The result model will support public managers in the process of budget plan and management control.

SYSTEM DYNAMICS FOR BUDGET PLANNING AND MANAGEMENT CONTROL

1. THE PUBLIC COMPANY IN THE MODERN ECONOMIC SYSTEM

Public company is the name which distinguishes particular corporation or organisms dealing with activities which are of particular social importance and that necessitate a complex system of controls, and laws which regulate their constitutions and organisations, case by case.

Although there is no net division between public companies and "non profit organizations" and private enterprises, a public company can be defined as organism whose sole object is not net profit. Generally, its object is to furnish services in a condition of equilibrium in which intuits are equal to expenses and/or liquid sums are used to cover expenses.

In a public company the decisions made by the Board of Directors follow the objective of obtaining the best possible service with the available resources and its success is measured on the basis of the quantity and quality of the services rendered.

Since no criteria comparable to profit inspires the Board of Directors and the management of the enterprise, there is no careful verification of its grade of efficiency and its economic viability and the study of the aforementioned organization and the activities of all such organisms pivot exclusively on the central point of safeguarding its legal nature. But, undoubtedly, public companies are not wholly exempted from the natural pressures exercised by their surrounding economic environment.

When private companies which, and this is generally the case, offer their services to the public or to other enterprises are taken into consideration, the attitude of the buyers, their abstention or their readiness to purchase the services offered, are, in themselves, proof of their quality or of the goodly prices at which their services are marketed and, therefore, in the end, of the productivity itself of such state enterprises. In a certain sense, therefore, they too are subject to the laws of the market but their dependency upon them are somewhat limited. Many private companies enjoy a monopoly of legal or unwritten rights which are, in fact, a direct result of the same nature as those enjoyed by industries in general before they were nationalised.

The following are the characteristics of a public company:

- * absence of a profit making goal;
- * prevalence of distribution objectives;
- * conditions and obligations in the choice of objectives and strategies;
- * it cannot be conditioned financially by its clientele;
- * the style of management is different from the style adopted by private enterprises;
- * managerial control which is always practically non existent and/or inadequate.

Furthermore, the mission of a public company is decidedly conditioned by two elements which are not easily divisible:

- the necessity of living an efficiency - efficacy type of relationship within a frame of regulations sufficiently defined by the economic public subject;
- the contextual necessity of the economic subjects of maximising their identity.

In this situation, an innovative process which would bring about a transition from a typically bureaucratic type of enterprise to a managerial characterised by an organizational function correlated with all the other aims and objectives of the enterprise, within the perspective of internal change linked to the continues development of the objectives of the enterprise: in short, the development of the culture of public services, is to be hoped for. The introduction and the ensuing affirmation of new corporation roles (especially in the fields of planning and managerial verifications), the introduction of new and specific skills, would create the conditions for a progressive characterisation of public services in a managerial profile different from the one to which we have been accustomed in the past.

2. THE ROLES OF PLANNING AND CONTROL

In order to take into consideration planning and verification in public enterprises, it is necessary to verify the applicability of the rules concerning the "science of administration and fundament rules of the economy of an enterprises" to the peculiar reality of such organisms.

The introduction of the concept of economy, and of efficacy and efficiency, is based on the assumption that there will be a serious and all - encompassing revision of the very characteristics in the management of the enterprise accompanied ideally by more adequate planning. To this end the planning activity should include the following characteristics:

1. A fully detailed system of information which would make it possible to produce not only all the "documents" pertaining to the budget (invoices, wage packets, etc.)but would also place before the scrutiny of the Board of Directors "information" which would facilitate the role of being acquainted with and interpreting all the variables which could possibly influence or determine the future activities of the enterprise;
2. A more complete and articulated range of possible alternative lines of action to be evaluated by taking into consideration the aforementioned information;
3. A more precise and accurate study and simulation of the proposed alternatives such as to make it possible to choose the best solutions.

The Board of Directors should be able to verify in an integrated manner the complex organizational system of the enterprise by taking into consideration the correlations and the interdependence existing in all its parts. The informative system should not simply be organized for the sole purpose of producing accounting documents but should consent a critical analysis of objective reality as it is mirrored in the outside world and the definition of an aggregated model of data, resulting in the identification of the so-called "key variable" or "master variables", which it is essential to control if a viable strategic planning is to ensue.

To data, public managers have put into a type of programme characterized by a management vision based on a brief vision and identifying financial choices on the basis of past experience with limited or partial adjustments for the future.

The management instruments in use today are inadequate, for they are based on mathematical models stemming from operational research valid only for rigidly quantitative volumes and which are applicable only to limited areas of operational activities. In addition, such models are often static or linear and represent the relationship among the variables in a manner which is too superficial, so that their validity is limited to the period of time in which the conditions "surrounding the issue" can be considered constant; such situations can, in fact come into being only in brief periods of time.

Notwithstanding the above mentioned difficulties, it is, nevertheless, evident that each organizing organism needs to develop managerial verification and a system of control on the part of the Board of Directors which finds its natural synthesis in the budget process.

The budget is a plan for future activity in which all the objectives that the enterprise intends to reach in a period of time which is generally fixed in one year. The budget is different from all the other instruments used to control management, because of its global nature, for it encompasses each and every activity of the enterprise: all the functional areas, the organizational levels, its products and, generally, all aspects of the business. In synthesis, the budget expresses the very model of behaviour on the part of the enterprise.

The Board of Directors uses the budget to achieve the following:

- to programme the use of company resource to the end of achieving its objectives;
- to communicate plans and quotas of objectives to the responsible administrators;
- to motivate the administrators to the achievement of the established objectives;
- to compare effective activities with the programmed results;
- to influence the behaviour of its administrators.

The budget is expressed in a series of administrative documents; these must naturally be approved by the Board of Directors making it binding among the different departments that have worked together to draw up the plan, at a global level. The budget assumes the form of a preliminary balance sheet; in effect it conveys the management programmes of the following or future activities of the company duly formalised and having the typical structure for budgets which are synthetic systems of economic, financial and patrimonial values.

The drawing up of budget is an important part of the process of planning and control in every organization but it is an even more important in a "non profit" organization than in a company oriented towards profit making.

In public companies and, particularly in industrial private enterprises, the greater part of expenditures are of a technical nature linked to the productive process and to its equipment and installations. The quantity of labour and of raw materials necessary to production vary within rather narrow limits or limits which can easily be determined. It is, therefore, possible to exercise only a limited influence on such items during the formulation of the budget. Once what is to be produced and in what quantities it is to be produced has been decided, what sales procedures are to be adopted and through what channels of distribution, largely coincides in the budget with a declaration of design.

In the greater part of public companies the determination of costs of production and the distribution of the services furnished are more difficult to ascertain as the exact predetermination of the results of management. In such conditions the budget is necessarily a valid instrument of support which helps to establish what has to be done or how to utilise available resources to maximise the institutional finalities which they develop. But the very peculiar characteristics and circumstances which have been described above, together with demotivation, deresponsibility and disinformation have influenced the role effectively assigned to the activities of planning and verification and, in the final analysis, also to all the budget activities which is at its very echelons have matured a certain distrust in the possibility of using quantitative instruments to support their individual decisions.

Following the aforesaid considerations, it is possible to state the decisional instruments for a company's strategic choices must:

- be capable of describing the exact level of the company;
- be characterised by few variables with the objective of consenting a rapid and intuitive understanding of the results and, therefore, be capable of fortifying managers' trust and faith in the instrument;
- consider the "time" variable as the natural driving force of the parameters that characterise the process;
- offer relative answers to quantitative variables to the suitable level of aggregation in order to be able to integrate them with the intangibles that the manager elaborates on the basis of his own individual experience;
- be manoeuvrable or manageable with non difficulties by the users who generally know little or nothing of computers.

System Dynamics certainly have the characteristics which best respond to the above mentioned necessities.

3. THE BUDGET AS A PLANNING AND CONTROL TOOL IN LOCAL AGENCIES

Municipalities constitute the most elementary organized unities in which Italian national enterprises are divided. Municipal enterprises represent state enterprises in as much as they are constituted with an act of common law which recognises them as the legal public personality of such territorial organisms.

The municipality can be defined as state enterprise and a distribution enterprise whose principal aims are those of furnishing assets and services to satisfy a certain number of categories of social needs such as, for example, education, public security, justice, etc.. To prepare such services, the local agencies turn to a number of familiar "management" forms such as for example, the following:

- production in economy through the use of their own structures and employees;
- using special institutions such as consortiums, or other types of co-operatives or other types of special corporations;
- by entrusting state concessions and contracts to private parties.

To carry out their tasks, local agencies in Italy are essentially dependent on direct and indirect taxation. Having their power to levy taxes been almost totally suppressed and, following the coming into force of the laws concerning the tributary reform (aimed at unifying local and state finances) and, successively, having their power of expenditure been further hampered by the yearly regulations concerning local finance, as of 1979 local agencies have witnessed limitations and deformations of their constitutional autonomous power and rights.

The planning and verification function of a local agency is carried out through a series of estimated statements of accounts drawn up and presented on the basis of legislations concerning public balance sheets. The fundamental aspects of this discipline are part of a state law which, among other things, provides for the following points.

1. The drawing up of a pluriennial balance sheet in direct co-ordination with the pluriannual balance sheet of the region to which it belongs.
2. The drawing up of an estimated annual balance sheet containing the stages and limits of cash and competence.

3. The obligation of financial balance for estimates of competence in the annual balance sheet, while for cash estimates it is specified that payments are not to exceed the total of introits plus the initial deposits of the fund.
4. The classification of introits in titles, categories, and chapters and of expenses incurred for titles, ledgers, divisions, categories and chapters.
5. The elaboration of a recapitulatory general frame of the estimated balance sheet with all differentiated results set out.
6. The lay out of reverse funds and the identification of the accounting and administrative procedures for their expenditure.
7. The regulation of all residual sums.
8. The preparation of an illustrated note with the administrative and economic results reached at the end of the financial year.

However, such documents do not have a pragmatic role, nor do they present an easily identifiable strategic content for they do not clarify the purposes and the objectives which the volatile organ of the municipal structure intends to reach in the future.

In order to overcome the above mentioned limits, there is a new regulation which strives to modify both the cultural and behavioural conduct of managers capable of furnishing the state enterprise the possibility of obtaining the management instruments which up to now belonged exclusively to private enterprises.

Through a clearer and more incisive attribution of responsibility and discretionary power among the administrative and political organs, it may be possible to develop an effective process of planning which finds its synthesis in the drawing up of the annual and pluriannual estimated balance sheet.

The estimated annual balance sheet is denominated "double and mixed"; double in as much as it examines the introits and the expenditures concerning competence and cash, mixed in as much as it contains in the prospects regarding competency and cash, both the administrative fund and the cash fund. The results of the administration (surplus/deficit/administrative balance) and of the cash flow are important insofar as they help to increase or diminish the available financial sums of competence and cash in future exercises. A condition of financial equilibrium is foreseen in the prescribed balance: the balance of the introits is confirmed and is to be ascertained together with expenditures which are estimated in the course for the exercise. The cash balance which meet the conditions of liquidity, can accept both the balance and a surplus while deficits are absolutely forbidden. The expendible sums, made up of former residuals and of payments into competence accounts, cannot exceed the introits resulting in the initial cash fund.

The annual estimated balance sheet is very different from the concept of budget. It does not place into evidence the objectives and the evaluations comparable to those included in a budget; it contains, instead, an ensemble of allocations of funds to cover expenditures which are to be met with estimated sums of introits. It is not always possible to discover in this statement the programmed objectives which are to be realised, or the global institutional, economic or distribution purposes attributed to the public company or the responsibilities of each executive in the different operational sectors. There is also no information or data in the statement of accounts, suitable to illustrating and pointing out the objectives which have been

reached or the managerial skills used to reach such finalities and objectives. In such conditions it is also difficult to carry out a quality control of the services being offered or to measure the average managerial levels of efficiency and efficacy.

It is, therefore, opportune to revise the techniques used to draw up the estimated annual balance sheet in order to conceive it from a very different view which must necessarily be transformed into an efficient instrument of a complex planning and control process in the local agencies.

4. THE MODEL FOR AN ECONOMIC FINANCIAL BUDGET

The economic financial system of any enterprise, both private and public, can be identified by two "poles", "liquidity" and "margin" which represent the dual reality of an organization pertaining to the financial and to the economic factors. Liquidity concentrates all the cash flow (collection of outstanding debts and payments), the "balance" represents the financial requirements or the financial surplus. The "margin" concentrates the economic competence values of the period and through the "balance" determines the economic result.

However, the peculiar characteristic of public companies and, therefore, also of local agencies, is that their management is not oriented towards profit making but towards a balance between intuits and expenditures which determines the so called economic-financial equilibrium. The economic management of these enterprises is completely overlooked, determining, in consequence, a poor or totally non-existent control of economy, efficiency and efficacy. On the other hand, an efficient economic control requires, inevitably, the determination of relationships and agreements among the different flow of economic outlays manifest during the administrative period, the flow of a financial nature and, finally, the variation which have taken place in the initial assets, justified by the dynamic elements of management as expressed in the financial and economic balance sheets.

Generally speaking, a distinction can be made among the various levels of management: those determined by the lack of coincidence among the economic flow and corresponding financial flow and levels of capital, moved in harmony with the economic-financial choices, from the flow of invested capital whether it be on hand or borrowed.

It follows that the model of an economic-financial budget which can be described with the methodology of the System Dynamics will contain the state variables which coincide with the "levels" and correspond to the voices included in the assets, while the "flows" which will coincide with the voices of the financial fund will determine the variations.

It is necessary to point out that in the economic-financial model, the indications of the levels are of particular importance: the levels will have a positive or negative sign according to their correspondance voices of the assets situated respectively in the active or in the passive zone. It follows that the algebraic sum of all the levels of the economic-financial system is necessarily null(zero). There is, therefore, a perfect balance.

5. THE MODEL AND THE CONCLUSIONS

The model which is still being perfected is illustrated in the figure.

The state variables (levels) taken into consideration, as far as the activities of the assets of the local agency are concerned, are as follows:

- cash fund;
- immobilizations;
- other activities;

while the passive voices were synthesized through:

- mortgages and long term financements;
- other passive voices;
- result of the annual exercise.

From the causal diagramme, all the correlations existing among the variables can be easily deduced.

The model presently is implemented on a Personal Computer, using VENSIM (simulation modelling tool), and is currently under test for the assessment of the parameters introduced, at the faculty of Economics of the Rome University with the data having been furnished by a local agency situated in Northern Italy.

The model is developed with two specific aims:

- the first and principal aim is to use a methodology which can help students to better understand the process of budgeting in a public company; this subject is under discussion in a course on public accounting at the faculty of economy and currently is the argument of a dissertation;
- the second objective is to use the model in an operational manner as soon as the value of parameters are viable in the local agency, where the data was collected with the intent of furnishing an innovative tool of support to "management" for the purpose of verifying the budget plan.

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